

Appln. No. 10/024,759  
Amdt. dated July 14, 2005  
Reply to Office Action dated May 31, 2005

### R E M A R K S / A R G U M E N T S

Entry of the present Amendment and reconsideration of the present application, as amended, are respectfully requested.

The May 31, 2005 Final Office Action and the Examiner's comments have been carefully considered. In response, claims are amended and remarks are set forth below in a sincere effort to place the present application in form for allowance. Claims 11, 17 and 18 are amended to place the claims in better form for allowance and the amendments to the claims are not related to patentability. Also, the amendments to claims are supported by the application as originally filed. Therefore, no new matter is added.

Inasmuch as the present Amendment raises no new issues for consideration, and, in any event, places the present application in condition for allowance or in better condition for consideration on appeal, its entry under the provisions of 37 CFR 1.116 are respectfully requested.

### PRIOR ART REJECTIONS

In the Office Action, claims 1-5, 7 and 10 are rejected under 35 USC 102(e) as being anticipated by USP 6,309,353 (Cheng et al.). Since the Examiner addressed claims 6 and 11-14 in the

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body of the rejection of claims 1-5, 7 and 10 in view of Cheng et al., it is assumed that these claims have also been rejected under 35 USC 102(e) as being anticipated by Cheng et al. Claims 8 and 9 are rejected under 35 USC 103 as being unpatentable over Cheng et al., and further in view of USP 6,690,816 (Aylward et al.). Claims 15-20 are rejected under 35 USC 103 as being unpatentable over Cheng et al. in view of Aylward et al., and further in view of USP 5,590,654 (Prince).

The Examiner's rejections are respectfully traversed on the grounds that the cited prior art does not disclose, teach or suggest all of the features set forth in independent claims 1 and 16.

Claim 1 is directed to a method for analyzing a data set of an object to be examined wherein voxels of at least first and second types are present. The voxels are classified as voxels of the first, second or further types (a first classification step) and thereafter a determination is made as to which of the voxels of the first type are boundary voxels that adjoin voxels of the second or further types (a second boundary voxel determination step). This implies two things: 1) boundary voxels are a subset of the first type of voxels; and 2) boundary voxels are not the second or further type of voxels so that in the first step, there is not yet a determination or identification of a boundary voxel.

Accordingly, the second boundary voxel determination step in

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claim 1 requires analysis of voxels of a single type (the "first type") to determine which are boundary voxels. There is no such analysis of voxels of the second or further type of voxels classified in the first classification step in claim 1. An advantage of the initial voxel classification and limited, subsequent boundary voxel determination based thereon is that analysis of fewer, more relevant voxels (only the voxels of the first type) is required.

For example, in an exemplifying embodiment of the invention described in the specification wherein an aneurysm in a blood vessel is analyzed, the first step involves classifying voxels as being either vessel voxels or tissue or other type voxels and the second step is to determine which of the vessel voxels are boundary voxels. A determination is also made as to which of the vessel voxels are aberration voxels, but a determination is not made as to which of the tissue voxels are boundary or aberration voxels thereby reducing analysis of the total number of voxels.

Cheng et al. teach a two-step process wherein in the first step, voxels are pre-classified as being "tumor", "normal tissue" or "boundary" voxels (col. 4, lines 32-37, col. 5, lines 49-53). A membership function is created for each type of voxel using fuzzy reasoning (see Fig. 7). Thus, in the first stage, there is a pre-classification of all voxels as being one of the three types. In a second step, defuzzification is used to classify all

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of the voxels as being one of the same three types, i.e., to improve the pre-classification (col. 5, lines 54-56).

The Examiner alleges that Cheng et al. includes two different "first types" of voxels, namely, pre-classified voxel data and voxels in a darker area for "tumor", and a single "second type" of voxels, namely, voxels in a brighter area for "normal tissue" (Office Action at page 2).

The Examiner's position distorts claim 1 in that the interpretation of the "first type" of voxel is being changed to suit the Examiner's identification of elements that satisfy the first voxel classification step and the second boundary voxel determination step. If the first type of voxel in Cheng et al. is the pre-classified voxel data, then Cheng et al. cannot perform the initial step of classifying voxels as voxels of a first type or a second or further type since at this stage, all of the voxel data has been "pre-classified" and thus all is of the first type. There is thus only a single type of voxels, and no second or further types (i.e., only pre-classified voxel data constituting a single type according to the Examiner).

On the other hand, if the Examiner is considering the first type of voxel to be a "tumor" voxel (and second and third types to be "normal tissue" and "boundary"), then Cheng et al. does not perform the step of determining which of the voxels of the first type (the tumor voxels) are boundary voxels since they have

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already been determined to be tumor voxels and not boundary voxels.

The different types of voxels designated in Cheng et al. do not correspond to the different types of voxels in the present claimed invention, when considered in view of the recited steps manipulating the voxels set forth in claim 1, and therefore Cheng et al. cannot be interpreted to have the same types of voxels or perform the steps on different types of voxels as set forth in claim 1.

Additional differences between the present claimed invention as defined by claim 1 and Cheng et al. include the fact that Cheng et al. does not suggest the possibility of forming a single "type" of voxels which can be partitioned into at least two different subsets, one for boundary voxels and another for aberration voxels, and that Cheng et al. does not classify voxels as aberration voxels indicative of an aberration in an object. As to the latter point, the Examiner takes a position that when a calculating parameter  $r$  is larger than a threshold, the tumor is judged malignant and when smaller than the threshold, the tumor is judged benign. Determination of whether a tumor is malignant or benign does not constitute "an aberration in the object" (an aberration being commonly defined as a deviation from the proper or expected course). It is the mere presence of a tumor that is an aberration and Cheng et al. does not perform a distance

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analysis for voxels to determine the presence of a tumor. Thus, Cheng et al. does not classify tumor voxels to determine which are aberration voxels as recited in claim 1, but rather classifies tumor voxels to determine the type of tumor which is considerably different.

In view of the foregoing, claim 1 is patentable over Cheng et al. under 35 USC §102.

Moreover, it would not have been obvious to one of ordinary skill in the art at the time the invention was made to modify Cheng et al. to arrive at the present claimed invention as defined by claim 1.

The other references of record do not close the gap between the present claimed invention as defined by claim 1 and Cheng et al. Therefore, claim 1 is patentable over Cheng et al. and all of the other references of record under 35 USC 102 as well as 35 USC 103.

Claims 2-15 are either directly or indirectly dependent on claim 1 and are patentable over the references of record in view of their dependence on claim 1 and because the references of record do not disclose, teach or suggest each of the limitations set forth in claims 2-15.

For example, with respect to claim 2, Cheng et al. does not disclose the determination of two different types of boundary voxels. The Examiner points out that Cheng et al. extracts a

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boundary between tissues to find cancer tissue from among tissue, but overlooks the fact that cancer tissue is not a subset of boundary tissue. Rather, cancer tissue clearly corresponds to voxels classified as "tumor". Thus, it is reiterated that Cheng et al. does not disclose, teach or suggest designating two different types of boundary voxels, both different than other types of voxels such as tumor voxels and normal voxels.

Claim 16 is another independent method claim that includes more specific descriptions of the types of voxels than defined by claim 1. Thus, claim 16 includes the steps of classifying voxels as vessel voxels or tissue or other type voxels and thereafter determining which of the vessel voxels are boundary vessel voxels.

Claim 16 is patentable over the cited references for reasons, *inter alia*, set forth above in connection with claim 1. Namely, as discussed above, Cheng et al. does not disclose, teach or suggest classifying voxels as one type of voxel (vessel voxels) and then determining which of the voxels of this type are boundary voxels adjoining a second type of voxel (e.g., tissue voxels).

Prince teaches imaging the heart but does not disclose, teach or suggest classifying voxels derived from the images in the manner defined by claim 16.

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Claims 17-20 which are either directly or indirectly dependent on claim 16 are patentable over the cited references in view of their dependence on claim 16 and because the references of record do not disclose, teach or suggest each of the limitations set forth in claims 17-20.

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Entry of this Amendment under the provisions of 37 CFR 1.116, allowance of the claims and the passing of this application to issue are respectfully solicited.


If the Examiner disagrees with any of the foregoing, the Examiner is respectfully requested to point out where there is support for a contrary view.



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If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,



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